Highbush Blueberries

An Expanding Crop in Ontario

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Introduction

Blueberries are a favourite fruit throughout North America. In 1982, in Canada alone, 23,000 tonnes of blueberries were produced for a value of $31.6 million. Over 70% of these were of the lowbush group grown in Eastern Canada and the remainder were highbush from British Columbia.

In the United States, the picture is different. Only Maine produces large quantities of lowbush blueberries whereas several states grow highbush. In 1983, the USA produced 42,000 tonnes of highbush blueberries with 78% coming from Michigan and New Jersey.

A small, but expanding, highbush industry exists in Ontario. In 1977, there were only five farms in Southern Ontario growing a total of 16 hectares of the berries. This year, about 150 hectares are scattered throughout the province, from Windsor in the southwest, to Barrie in the central region, to Ottawa in the east.

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Ecology and Distribution

The highbush blueberry (Vaccinium corymbosum L.) grows wild in Southwestern and Eastern Ontario, usually in the peat bogs around the edges of swamps or ponds. Here the bushes survive in soils high in organic matter which have a pH of about 4.5. They often grow on `hummocks', which are higher and slightly drier than the rest of the bog. It is these growing conditions that the grower must recreate to successfully establish vigorous highbush blueberry plantations.

The geographical area in Southern Ontario where these shrubs can be grown is limited by one factor: winter hardiness. Plants will be killed to the snow level by temperatures of about -30°C. This restricts the areas in which highbush blueberries can be grown and cropped to those within hardiness zones 5 to 7.

Since cultivated forms are being grown at the edge of the species' geographical distribution, not all cultivars will crop well. The cultivars available to the grower vary in their winter hardiness and each must be tested in the areas where they are to be grown.

Associated with the winter temperature in determining the commercial range is the length of the growing season. In the colder areas, where the season is relatively short, the range of suitable blueberry cultivars is restricted to those which will mature quickly. Some of the late-maturing varieties will never ripen in short-season areas.

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Research History

To ensure that growers know what are the best cultural conditions, the Ontario Ministry of Agriculture, Food and Rural Affairs has been funding research on the crop since 1968. At that time, a series of cultural and cultivar trials were started at the Horticultural Research Institute of Ontario's sites at Vineland Station and Simcoe. Dr. C.L. Ricketson initiated these trials and carried them out until 1980 when his successors took over and continued his work. That same year, J. Vandenberg, then at Kemptville College of Agricultural Technology, planted a trial plot to test cultivars suitable for Eastern Ontario.

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Cultural Studies

The first trial planted at Vineland in 1968 combined a cultivar evaluation with a study of different methods to reduce the soil pH. At Vineland, researchers reduced the pH of the fine, sandy loam on three plots with the addition of one of sulphur, peat, or sawdust. In a fourth plot, the pH was reduced by the addition of sulphur and the soil was raised into a bed 20 cm high. Eight cultivars were planted into these treated plots. In the early years of this experiment, the peat and sawdust treatments gave more vigorous plantings and higher yields than the others.

The second trial, planted on a Fox sandy loam at Simcoe in 1971, was begun to compare different soil amendments and mulches, and as a cultivar trial. Here, either peat or sulphur was incorporated into the soil to reduce the pH and a sawdust or corncob mulch added after planting. Three treatment combinations were tried: peat and sawdust, sulphur and sawdust, and sulphur and corncobs. Eight cultivars were grown in each combination. Consistently throughout this trial, the shrubs in the sawdust treatments out yielded those in the corncob one (Table 1).

Table 1: Mean yield for 1973-1978 from the highbush blueberry trial at Simcoe planted in 1971.

Soil incorporation medium	Peat	Sulphur	Sulphur
Mulch	Sawdust	Sawdust	Corncobs
Mean Yield 1973-78 (kg/plant)	1.7	1.6	0.8

As a result of the experiences in the first two experiments, researchers planted a third trial at Simcoe in 1979 to obtain information on four cultural practices: pre-plant peat incorporation, sawdust mulch, irrigation and cultivation between the rows. Here, the pH of the soil was reduced to 4.5 in all plots before the two cultivars, Blueray and Collins, were planted.

Using a split-plot design, researchers planted half the bushes into peat and the other half into the untreated soil; half were then mulched with sawdust. The plants were set up with trickle irrigation to be irrigated at ½ gallon, 1 gallon or 2 gallons/hour for two hours a day and the ground between the rows was either sodded down or clean cultivated.

The results of this experiment have shown that the best treatments so far are those where the plants were set in peat, mulched with sawdust, irrigated at 2 gallons/hour, and in those areas where the rows had been sodded down (Table 2). Although each single treatment shows a benefit, the best plots are those where all four good treatments have been combined.

Table 2: Yields for highbush blueberry cultural management experiment planted at Simcoe in 1972.

Cultural Practice	Total yield 1980 - 83 (kg/plant)	
	Blueray	Collins
Pre-plant Incorporation		
Peat	8.2	7.8
No-peat	5.4	6.2
Mulch		
Sawdust	8.4	8.4
No-sawdust	5.3	5.5
Irrigation		
½ gal/hr	5.6	5.6
1 gal/hr	6.9	5.8
2 gal/hr	7.8	8.5
Between-row culture		
Sod	7.1	7.8
Clean Cultivation	6.4	6.1

Those treatments designed to increase the organic matter content of the soil, that is, those using peat and sawdust, have benefited greatly in growth and yield of the plants in the early years. This is probably because the nutrient status and moisture content of the soil are increased.

The sod between the rows could also increase the organic content of the soil, but there are at least two other possibilities. The root system under the sod treatment may be developing unhindered whilst clean cultivation may be pruning it. The plant cover also may help to prevent widely fluctuating soil temperatures throughout the year.

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Cultivars

The first trials at Vineland and Simcoe gave a great deal of information on different cultivars which has led to positive recommendations for Southwestern Ontario. The trials at KCAT are also providing data on the cultivars suitable for Eastern Ontario. Descriptions of these can be found in the OMAFRA publication #430, Fruit Cultivars. Click here to order.

The yields from Simcoe and Vineland show that the cultivars Blueray and Berkeley were the most productive with the largest fruits (Table 3). These two both mature at mid-season . Earliblue is a low yielding cultivar, but because it is very early, could be useful as a small planting to catch the early market. Jersey and Coville are too late for Southern Ontario. In some years, over a third of the Jersey crop did not ripen until after Labour Day.

Table 3: Yield and berry size of highbush blueberry cultivars

	Mean Yield (kg/plant)		Mean Berry Size (berries/225 ml cup)	
	Vineland 1975-81	Simcoe 1973-79	Vineland 1975-81	Simcoe 1975-79
Blueray	3.9	2.5	82	78
Berkeley	2.9	2.1	82	80
Rancocas	2.9	–	199	–
Collins	2.5	1.7	106	101
Bluecrop	2.5	1.5	96	98
Jersey	2.5	1.5	143	128
Herbert	1.7	1.7	114	81
Coville	–	1.6	–	77
Earliblue	1.6	0.9	108	118

At Kemptville, the two 'half-high' cultivars, Patriot and Northland, are showing promise (Table 4). Patriot has much larger berries than Northland and has become popular with growers in Southwestern Ontario as well.

Table 4: KCAT highbush blueberry trial

Cultivar	Yield (tonnes/ha)		Average Fruit Size (gm)	
	1982	1983	1982	1983
Northland	2.4	11.0	1.7	1.0
Patriot	2.1	8.9	2.7	2.9
Jersey	0.3	6.7	1.6	1.4
Blueray	0.3	5.8	2.5	1.8
Collins	0.4	2.3	2.1	2.3

Cultivars like Patriot and Northland which naturally produce a short, squat bush, will probably do well in Eastern Ontario. In that part of the province, highbush blueberries are often winter-killed sufficiently to produce the squat form of bush. Depending upon the variety, however, the plants will continue to produce fruit (Table 4).

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Cultural Practices

Blueberries are a long-term crop, so careful preparation of the land before planting and careful nurturing during the first few years is needed to give strong, productive bushes. Preparation of the new field should begin one or two years before planting, and five major points should be considered at that stage: pH adjustment, weed control, nematode control, fertility of the soil, and planting stock.

The pH should be adjusted to about 4.5 by incorporating sulphur into the soil. If the original pH is much above 6.5, however, it will be difficult to reduce it to the correct acidity.

Weeds can cause serious problems, and the new field must be kept as weed-free as possible at all times before and after planting. There are some particularly persistent perennial weeds, such as Horsetail, which are adapted to low pH soils. As there are few herbicides registered for use on blueberries in Canada, however, the grower should check with his horticultural crop adviser before using any.

Nematodes can transmit viruses and seriously stunt root growth in a blueberry plantation. Since the plantation can live more than 30 years, the field must be as free of them as possible from the outset. The only satisfactory way to control nematodes is to fumigate the soil before planting; once the plantation is established, there is no method of control. The grower should sample for nematodes the

year prior to planting and then decide whether or not to fumigate. Click here to go to the Pest Diagnostic Clinic *(External link - see disclaimer)*.

The field's fertility should be established, and adjusted if necessary, also before planting. Blueberries, like all crops, need adequate inorganic nutrients for good growth. In the low pH soils of the blueberry field, several of the essential plant micronutrients become less soluble, hence less available to the plant. In Ontario's sandy soil, magnesium, iron, and manganese deficiencies have been seen, so the grower should monitor the status of these micronutrients carefully by regular sampling of the soil and the blueberry leaves. Click here for a list of Accredited Soil Testing Laboratories in Ontario.

Once the land has been properly prepared, healthy, and vigorous planting stock of recommended cultivars should be used. Ontario does not have a certification programme for blueberries, but there are several reputable propagators in the province. Click here for a list of Blueberry Propagators and Plant Suppliers. Growers should buy one - or two-year-old plants rather than unrooted cuttings as cuttings can be very difficult to root without proper facilities.

At planting, acidic peat moss dug into the soil around the plants will help them establish in mineral soils. Immediately after planting, a sawdust mulch should be put down, trickle irrigation installed, and sod laid between the rows.

Bushes will start to produce a small crop after two years and will build up to full production in five to eight years. Growers can expect to obtain about 12 tonnes/hectare (5 t/acre) in good plantations. At present, the demand in Ontario is for pick-your-own and the fresh market. As the acreage increases in the province, however, more of the crop will be diverted into the processing market.

A carefully established blueberry plantation will give years of trouble-free yields. It will probably be replaced only as plant breeders introduce new, improved cultivars for the various blueberry areas of Ontario.

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